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LETTER REPORT
FOR
BASF CORPORATION CHEMICAL SAFETY AUDIT
WYANDOTTE, WAYNE COUNTY, MICHIGAN

TDD: T05-9201-040
PAN: EMI1288PAA
TAT: TAT-05-23-02033

JUNE 17, 1992

Prepared for:

Duane Heaton
Deputy Project Officer
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EPA - REGION V

Contract Number: 68-WO-0037

Prepared by: Anne M. Burn Date: 6.17.92
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June 17, 1992

Mr. Duane Heaton
Emergency Response Section
U.S. Environmental Protection Agency
77 West Jackson Street
Chicago, Illinois 60604

RE: BASE Corporation Polyol Plant
Wyandotte, Wayne County, Michigan
TDD: T05-9201-040
PAN: EMI1288PAA

Dear Mr. Heaton:

The Ecology and Environment, Inc. (E & E) Technical Assistance Team (TAT) was tasked by the United States Environmental Protection Agency (U.S. EPA) to conduct a Chemical Safety Audit at BASF Corporation Wyandotte Polyol Plant, Wyandotte, Wayne County, Michigan, under TDD: T05-9201-040 issued on April 6, 1992. Tasks completed under this TDD included: providing the U.S. EPA with technical assistance and support during the BASF Corporation Wyandotte Polymer Plant's Chemical Safety Audit (CSA), investigating various aspects of the company's operation and preparing recommendations based on these observations.

The Chemical Safety Audit Team consisted of TAT members Sandra Basham and U.S. EPA On-Scene Coordinator (OSC) John Kjellstrand. During April 21 through the April 24, 1992, the Chemical Safety Audit team met at the BASF Corporation, Wyandotte Polymers Plant. During those four days, the team inspected the facility and met with the plant management. The topic of the meetings and the basis for the inspection was to discuss and observe plant operations and safety.

At the request of OSC Kjellstrand, TAT prepared a portion of the final report (Attachment A) which is being prepared and assembled by the U.S. EPA.

If you have any questions or need additional information, please contact us.

Very truly Yours,

ECOLOGY & ENVIRONMENT, INC.
Region V Technical Assistance Team

Anne A. Busher

Anne A. Busher (for Sandra Basham)
ATATL/Environmental Scientist

cc. Tom Kouris, TATL, Region V, Chicago, IL.
John Kjellstrand, U.S. EPA OSC, Chicago, Il.

ATTACHMENT A

7.0 CHEMICAL ACCIDENT PROTECTION

7.1 MANAGEMENT ACTIVITIES

7.1.1 Corporate Role in Facility Process Safety Management

The CSAT determined that health, safety and environmental protection are viewed as high priorities by all levels of BASF management and their employees. BASF's philosophy is summed up in the elements of their "Safety and Loss Prevention/Ecology Program." The elements of the program are:

1) Management commitment and support;
2) Assignment of responsibility, authority, and accountability;
3) Maintenance of safe working conditions;
4) Training;
5) Accident reporting, analysis, and record;
6) Emergency procedures and programs; and,
7) Acceptance of personal accountability.

Each employee and member of the management staff is dedicated to applying this policy to all aspects of facility operations.

The corporate services of BASF provide managers and supervisors with professional advice and counsel, health and safety and toxicology information, and guidance for regulatory compliance.

BASF Corporate reviews all aspects of operations at all BASF facilities on an annual basis. The reviews generate a list of minor "quick-fix" problems that need to be addressed, as well as a second list of more serious issues. Each issue raised by the audit team is given a date by which it is to be corrected. Quarterly letters are prepared by supervisors and the facility manager to report the on-going progress in rectifying these issues to the Corporate audit team. After 6 months, a Corporate team returns to the facility to ensure that progress continues and that the issue is resolved.

Each site is given a rating, ranging between poor and excellent, at the time of the audit. The Polyol Facility at the BASF Wyandotte Site has consistently received ratings of excellent over the last several years. Beginning in 1992, facilities that receive an excellent rating will have the frequency of their audits reduced to approximately every other year.

Corporate Services provide the Wyandotte site with technical resources and support, engineering and regulatory requirements, and provides professional leadership to site Ecology personnel. However, plant protocols and day-to-day

decisions are made at the facility level. Management of the Polyol Plant attempts to empower employees by giving them responsibility and accountability for their safety and productivity. Management theorizes that a deeper sense of involvement and ownership in the Plant will engender a greater concern for safety and productivity in their employees.

7.1.2 Facility Role in Process Safety Management

The maxim at the Wyandotte Site's Polyol Facility is "continuous improvement." As a result, processes, protocols, and standard operating procedures are constantly being reviewed and improved.

Most reviews are rather casual. The plant manager and various supervisors randomly check plant operations and note good and bad observations. These observations are conveyed to all shift workers via memos that are read at weekly safety meetings. Attendance at these meetings is mandatory and all attendees sign-off on an attendance sheet.

As required, Analysis Teams are constructed to look at specific concerns at the Plant. Recently, a "Job Safety Analysis Team," composed of a cross section of operators and managers, was assembled. This team was tasked to look, one at a time, at typical jobs at the Facility, and to study safety concerns associated with that job.

Any changes to plant processes undergo a more formal review procedure. The change is proposed then studied along with all possible ramifications of that change. The Process Supervisor and the Plant Manager have final approval on any process changes and the policy change cannot be instituted without their signatures.

8.0 ACCIDENTAL RELEASE INCIDENT INVESTIGATION

8.1 HISTORY OF ACCIDENTAL RELEASES/INCIDENTS

It is the policy of the Wyandotte Polyol Plant to record and investigate all spills and releases, regardless of size. As a result of this, the Polyol Plant recorded 48 environmental incidents since February 1989. Of these, only two were of the Reportable Quantity (RQ) as specified by SARA Title III. On October 2, 1990, an estimated 3694 pounds of propylene oxide was released, over a three day period, into the Detroit River. On November 2, 1991, an estimated 20 pounds of ethylene oxide was released to the air.

The Wyandotte Polyol Plant documented the cause of the two RQ releases as a combination of operator error and equipment failure.

A contributing factor to the failure of the equipment was overlooked or insufficient preventative maintenance.

It is the Wyandotte Polyol Plant's policy to report any spills or releases, regardless of size, to plant management and Site Ecology Services. This policy has been in place since at least 1989. It is the responsibility of the Ecology Services to notify all off-site agencies, including emergency services and state and federal agencies, in the event of an RQ spill.

Ecology Services also notify the Wayne County LEPC in the occurrence of spills over the RQ.

8.2 FACILITY INVESTIGATION PROCEDURES

It is the Wyandotte Polyol Plant's policy to report hazardous materials spills or air releases of any quantity to Plant management and Ecology Services. The written procedures for accidental release or fire reporting state that "the person spotting a fire or toxic chemical spill will first contact the control room via the emergency intercom phone or radio and describe the emergency. The control room operator will respond by pushing the appropriate alarm button." After sounding the alarm, the operator notifies the shift supervisor who then makes further decisions. The supervisor notifies the Plant management and Ecology Services. Ecology Services makes all necessary outside reports and assists the Plant personnel in filling out all forms. Information documented includes: date, time, reporter's name, location, chemical involved, media released to, quantity, description of incident, and other comments.

There are no formal written procedures for investigating a spill or incident. There are also no formal or written procedures for spill investigation follow-up to ensure that recommended preventative measures have been taken.

It is significant to note that although formal written procedures do not exist, the Plant does follow effective informal procedures for these activities. Those procedures follow.

An investigative team is assembled for all spills or releases. If the incident were minor, the team would usually be composed of Plant personnel and operators. If the release were RQ, personnel from management and Ecology Services would be included in the team. After reviewing the incident and determining its cause, the committee writes a memo which presents their findings and makes recommendations for preventing future incidents. This memo is provided to all levels of management. Supervisors convey its contents to all shift employees at the weekly safety meetings. If the recommendations include a procedural change, the Plant Manager must give his approval and all SOPs and protocols are altered to reflect said change. The committee does not follow-up on its recommendations to ensure that they are being observed.

9.0 FACILITY EMERGENCY PREPAREDNESS AND PLANNING ACTIVITIES

9.1 FACILITY EMERGENCY RESPONSE PLAN

The CSAT determined that the Facility Emergency Response Plan is updated on an annual basis. One professional is selected to review and, as needed, rewrite the plan. The draft rewrite is submitted to a committee for review and approval. Key areas of the plan are summarized in Table 1: BASF Corporation, Wyandotte Polymers Plant, Emergency Procedures Manual's Table of Contents.

9.2 EMERGENCY RESPONSE EXERCISES AND SIMULATIONS

The Wyandotte Polyol Facility conducts small-scale mock disaster drills on a regular basis. These drills are unannounced and are conducted at various times so that workers on all shifts are exercised. At a minimum, each shift is exercised three times a year (for a total of 12 exercises annually). All exercises are video taped and the tape is reviewed and critiqued by all participants at the weekly safety meetings held by all shift supervisors. Each simulation involves a different potential accident and is designed with specific goals and objectives in mind. Exercises are viewed as learning experiences and opportunities to test and verify the Plant's emergency capabilities.

Once a year, the Wyandotte Polyol Plant holds a large-scale emergency simulation which involves outside agencies and local emergency responders. This simulation is also video taped and a post-exercise panel, consisting of plant and outside personnel, is assembled to discuss the results of the drill. Interaction and cooperation between the Polyol Facility, the City of Wyandotte, and Wyandotte Emergency Responders is a high priority for Plant management. A great deal of time is dedicated to nurturing the positive relationship the Facility enjoys with the community.

9.3 FIRE, EVACUATION, AND RESCUE CORRIDORS

The CSAT verified that the following communication systems and equipment are available to carry out site emergency response plans by the emergency response organizations. Text hereafter through CSAT report page XX, inclusive, was derived exclusively from the Facility's Emergency Procedures Manual.

A. EMERGENCY ALARM PROCEDURES

1. The person spotting a fire or toxic chemical spill will first contact the control room via the emergency intercom phone or radio and describe emergency.

TABLE 1

OUTLINE OF CONTENTS

I. INTRODUCTION

- Purpose
- Emergency Planning Organizational Structure
- Description of Responsibilities
- Personnel Training

II. EMERGENCY ALARM SYSTEM

- Emergency Drills
- Description of Emergency Alarm System
- Emergency Alarm Procedures
- Emergency Vehicle Access
- Polyol Control Room Emergency Communications Procedures
- EPO Emergency Response Plan
- Polyol Maintenance Emergency Response Plan
- Laboratory Emergency Communication Instructions
- Off-Site Emergency Communications Procedures
- Alternative Methods of Communication
- Evacuation Procedures
- Personnel Accounting
- Emergency Shutdown Procedures

III. FIRES OR EXPLOSIONS

- Firefighting Procedures
- Personnel Responsible During Fires

IV. CHEMICAL SPILLS OR EMISSIONS

- Guidelines For Large Chemical Spills
- Reportable Quantities
- Personnel Responsible When Shutdown Alarm Is Sounded
- pH Control System Alarm
- Small Chemical Spill in Polyol
- Nitric Acid Spill Procedures
- Butane Spill Procedures
- Transportation Wrecks Inside Plant Boundaries
- Transportation Wrecks Outside Plant Boundaries
- ACN Alarm Procedure
- Flammable Vapor Alarm
- TOC Alarm Procedure

V. MEDICAL EMERGENCIES

- ACN Exposures

TABLE 1 - PART 2

VI. UNSAFE REACTOR CONDITIONS - CONVENTIONAL POLYOL

- Low Reactor Temperature
- Low Catalyst Concentrations
- Temperature Excursions
- Unusual Pressure Profile

VII. UTILITY FAILURE

- River Water Failure
- Nitrogen Loss
- Emergency Steam Outage Procedure
- City Water Loss
- Electrical Power Loss
- Electrical Power Loss - Deluge Trip Button
- Instrument Air Loss
- Safety Shower/Eyewash Loss

VIII. WEATHER

IX. BOMB THREAT

X. EMERGENCY EQUIPMENT INSPECTIONS AND PREVENTATIVE MAINTENANCE

22. The control room operator will respond by pushing the appropriate alarm button. Alarm #1 (warble alarm) will initiate plant shutdown. The other alarm will indicate plant difficulties but will not require shutdown.

3. The control room operator gives preliminary message over the speaker phone system, e.g. "There is a propylene oxide spill at the storage tanks. This is not a drill." The control room operator will then contact the shift supervisor via the radio base station and stand by for instructions. The situation should be communicated over the speaker phone periodically or as new information is required.

4. The supervisor will survey the emergency scene and advise the control room of the appropriate speaker phone message. For example:

   Fire:

   "There is a serious ethylene oxide fire at the storage area west transfer pump. All none-operating personnel are to evacuate and congregate at the south end of the new tank farm. Operating personnel are to follow emergency procedures."

   Toxic Chemical Spill:

   "The acrylonitrile storage tank has ruptured. All non-operating personnel are to evacuate and congregate at the Polyol Administration office parking lot. Operating personnel are to follow emergency procedures."

   Non-Hazardous Chemical Spill:

   "The Propylene glycol tank has overflowed. The pond man is shutting down the pond. This will not affect other plant areas."

5. The control room operator then conveys the message over the speaker phone system.

6. The designated operator remains in the control room while other personnel take appropriate emergency response measures (except when evacuating).

7. A speaker phone message is given to indicate that the emergency is over.

B. FIRE FIGHTING PROCEDURES

Alarm Types	The emergency shutdown warble alarm should be activated for all fires with visible flame.
Emergency Response	1. Shutdown Process Area and Tank Farm. 2. Investigate at emergency scene. 3. Put out incipient stage fires.

4. Call Wyandotte Fire Department if the fire involves a building or is beyond the capabilities of Polymers Plant personnel.
5. Evacuate the plant if the fire can't be controlled.
6. Call the Plant Manager/Production Manager immediately prior to/or after an evacuation occurs.

Types of Firefighting Equipment

1. Wheeled extinguisher containing 150 pounds of dry chemical or Purple K.
2. Multi-purpose fire extinguishers.
3. Fire truck equipped w/ 500 lbs of Purple K.
4. The Wyandotte Fire Dept. has fire fighting foam to spray over a diked area; must be requested by plant.
5. Deluge systems are located at the Oxide storage tanks, Butane storage tank and in the production areas.
6. Fire monitors and Deluge systems are located at the oxide unloading and butane unloading hazardous materials storage area, and process areas. Fire monitors are located at each area.
7. High and low water pressure fire hydrants are located throughout the plant.
8. Sprinkler systems are located at various locations throughout the plant.

Alternative Method of Putting Out Fire

1. Shut off pumping system or close isolation valves when putting out pipeline fires.
2. Shut off air supply to close automatic valves.
3. Shut off nitrogen supply and vent tanks to reduce pressure or close automatic valves. This will reduce the flammable liquid flow.

Flammable Chemicals at Wyandotte Polymers

Flammable Materials

1. Ethylene Oxide
2. Propylene Oxide
3. Acrylonitrile
4. Styrene
5. Busch Pump Oil
6. Polyol Filter Cake
7. Butane
8. Misc. Drum Materials

C. GUIDELINES FOR LARGE CHEMICAL SPILLS

1. Types of alarms for large spills

a. Hazardous - sound plant shutdown alarm

b. Non-Hazardous - sound general announcement alarm unless shutdown is required.

2. Follow evacuation procedures wherever a large uncontrolled spill of EO, PO, Butane, ACN, or TDI occur. Do not manually trip deluge or flood with water unless you are in the area and can trip the deluge quickly without risking injury.

3. Stop the spill from occurring whenever possible, e.g.
   a. Shut-off pumps
   b. Shut-off valves

   Do not expose yourself to chemicals in order to stop it from spilling. Wear proper safety equipment.

4. Prevent spill from reaching the pond, e.g.

   a. Shut-off the reactor area sump pump
   b. Shut-off the east trench system
   c. Shut-off the west trench drain
   d. Shut-off the EPO Plant trench
   e. Shut-off clean & dirty water lift stations

5. Shut down the plant and pond to prevent spill from reaching the river

6. Contact the Production Manager, Production Superintendent and Plant Manager

7. The Production Manager, Production Superintendent or Plant Manager will report all hazardous material spills per Wyandotte SPB no.5. SPB-5 should be regularly reviewed and updated.

D. WEATHER

Use the weather radio to determine whether shutdown required during unusual weather conditions.

A.	Tornado Warnings	Action Taken
	1. Tornado sited within a 5 mile radius	a. Complete plant shutdown
	2. Tornado sited within 10 mile radius	a. Hazardous material transfers suspended b. Restricted outdoor activities
	Tornado Watch	a. Restricted outdoor activities

B.	Severe Lightening Storm	a. Shut off flammable material transfer b. Restrict outdoor activities c. Oxide additions shutdown
C.	Wind Storm-> 60mph	a. All persons going outdoors will wear goggles b. No climbing in pipe rack or on tank truck, tank cars or storage tanks.

9.4 EMERGENCY EQUIPMENT PROVISIONS

As mentioned in the previous section, the Wyandotte Polyol Plant has many types of emergency equipment placed in strategic locations throughout the facility. Fire extinguishers of several different types are readily available, as are a total of 29 Self-Contained Breathing Apparatus (SCBAs). BASF has supplied the Wyandotte Fire Department with a wagon-mounted foam fire extinguisher to be utilized by the Fire Department if they are called in to assist in extinguishing a large fire. The Polyol Plant also maintains a Hazardous Materials Incident Response trailer that contains all equipment necessary to respond to incidents requiring up to level A protection. The trailer is used on-site, if needed, and is available to respond to accidents involving BASF products at remote locations. All storage tanks of flammable materials in the Polyol Plant are surrounded by a deluge system that releases vast quantities of water in the case of a fire or accident creating a flammable atmosphere. The deluge system also extends to the tank car unloading area.

The fire extinguishers and SCBAs are inspected and charged at regular intervals. The automatic sensors that trigger the deluge system are tested during regularly scheduled emergency response drills and the system itself is maintained by the contractor that installed it.

The CSAT determined that emergency response training is an ongoing process at the Wyandotte Polyol Plant. Many of the plant personnel have received OSHA 24- or 40-Hour Emergency Responder Training. All personnel participate in regular drills and seminars designed to enable them to respond quickly and correctly in the event of an emergency.

9.5 EMERGENCY RESPONSE CHAIN OF AUTHORITY

The official chain of authority to be followed in the event of an emergency is discussed in Section 9.3. However, it is worthwhile to note that all Polyol employees, regardless of position within

that chain, have the authority to sound an alarm if they note a situation they feel warrants such action.

9.6 EMERGENCY RESPONSE MANAGEMENT PROCEDURES

Management at the Polyol Plant plays an integral role in responding to spills, fires, and other incidents. Operators and other employees, however, have been given the authority and responsibility to initiate emergency response activities independent of management. In most cases, management and Ecology Services are responsible for decisions such as the notification of local emergency responders and other outside agencies.

9.7 EMERGENCY COMMUNICATION WITHIN THE FACILITY

The emergency communication system within the Polyol Plant appears well thought out and includes several levels of backups. The site's emergency broadcast system and intercom system allow site personnel to speak directly to the control room and for announcements to be heard throughout the facility. According to the Emergency Procedures Manual, phones are located on the east side of the oxide storage tank, under the south #4 load rack, on the south wall outside the utility building, on the west wall outside the Bio. Lab., and in the #2 Blend Building (ground floor).

Verbal announcements are backed up by alarm horns and sirens. The communication system operates from two separate power sources which makes it less vulnerable to a power failure. But, should both power sources go down, a battery-operated communications system is available. The entire communication system is tested during each emergency response simulation (approximately 12 times a year), and preventative maintenance is routinely carried out. All personnel are trained on the system and get practical experience utilizing it during emergency response drills.

While on-site, all managers and supervisors carry scanner radios that can be used to monitor several channels of communications at any given time. Managers and supervisors also carry pagers by which they can be contacted 24-hours a day.

9.8 EMERGENCY TRAINING REQUIREMENTS

All supervisory personnel at the Polyol Plant receive 24 to 40 hours of OSHA-approved training with annual refreshers. This level of training is also provided to operators and other personnel whenever feasible. Currently, approximately 50% of employees at the Polyol Plant have received this level of training. Training is provided by certified personnel within BASF Corporate Ecology. Emergency response drills and weekly safety meetings also provide ongoing training to employees of the Polyol Plant.

9.9 MONITORING STATIONS FOR CHEMICAL RELEASES

As previously noted, monitors for flammable or combustible atmospheres have been installed at strategic locations around the product storage tanks, the tank car unloading racks, and anywhere a release might occur during product transfer, storage, or utilization. These sensors are tied directly into the facility's deluge system. Ecology Services also maintains a supply of chemical-specific colormetric tubes to be used in identifying small leaks.

9.10 FOLLOW-UP RELEASE PROCEDURES/INVESTIGATION

See Section 8.2: Facility Procedures (Synonymous)

12.0 CONCLUSIONS

1. A thorough review of both releases provided a likely cause for the incidents and preventative actions to avoid a recurrence. Actions taken after the releases were deemed appropriate by the facility for these incidents. Detailed failure analyses were not performed.

2. While sensors are in place at many places throughout the facility, the propylene oxide release did not register on any of these sensors. No sensors were in place at the point of the release and three days elapsed before the release was noted and stopped.

3. The Wyandotte Polyol Plant has a comprehensive Emergency Procedures Manual that was in place at the times of the incidents, and that is exercised regularly. The plan is detailed and task specific but has not yet been integrated into Wyandotte's and Wayne County's Emergency Contingency Plans.

4. Conversations by the CSAT with local emergency responders confirmed that BASF Wyandotte is in the forefront of facilities trying to effect a positive change via planning and community outreach.

13.0 RECOMMENDATIONS

1. The effective informal procedures utilized by the BASF Wyandotte Polyol Plant for reporting and investigating spills of all sizes and other incidents should be formalized in writing. These procedures should include formal guidelines for the composition of an investigative team, a format for the presentation of their findings, a clear procedure for the dissemination of their findings throughout the plant and its personnel, and an assignment of responsibility to follow-up on recommendations made by the investigative team.

2. Procedures which incorporate information learned from the spill investigation into the employee training program should be formalized in writing and enforced.

3. The Facility should work closely with the Wyandotte and Wayne County LEPCs to better inform the community of Plant hazards and assist in developing response protocols.